125

A SHORT

ACCOUNT

OF A

COURSE

OF

NATURAL and EXPERIMENTAL PHILOSOPHY,

COMPREHENDING

MECHANICS, HYDROSTATICS, and PNEUMATICS, with the Elements of OPTICS and ASTRONOMY; which will include all the uſeful and curious DISCOVERIES that have been made by the moſt diligent and accurate ENQUIRERS into NATURE.

To be begun on *Monday* the 10th of *January*, at Six o'Clock in the Evening, at the Cordwainers Hall,

BY

I. THOMPSON,

AND

R. HARRISON.

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BRITISH MUSEUM

A SHORT
ACCOUNT
OF A
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OF
Natural and Experimental
PHILOSOPHY.

LECTURE I.

The INTRODUCTION.

IN which will be defined, and clearly illuſtrated by familiar Inſtances, the Properties and Modes of Body in general, *viz.* Extenſion, Solidity, Mobility, Diviſibility, Inactivity, Gravitation, Attraction, and Repulſion.

POSITIVE Levity ſhewn to be no Property of Body, but that the Force of Gravity equally affects all Matter, and therefore is in Proportion to the Quantity of Matter contained in any Body: Proved by the curious Experiment of a Guinea and Feather let fall in Vacuo.

THAT the Effects of Powers, ſuch as Gravitation, Light, &c. exerted as from a Centre, decreaſe in a reciprocal Duplicate Ratio of the Diſtances, ſhewn and made eaſy to common Apprehenſions by a convincing Experiment.

THE Centre of Gravity in Bodies diſtinguiſhed from the Centres of Motion and Magnitude, proved by divers Experiments, and applied to account for the ſtanding, falling, and rolling of heavy Bodies in general, and the unſteady, indirect and waddling Gait of ſeveral Animals.

LECTURE II.

MOTION explained, abſolute and relative, equable, accelerated and retarded.

SIR *Iſaac Newton*'s Laws of Motion explained, and illuſtrated by a great many Experiments performed by the Whirling Table and other Apparatus, to prove That all Bodies endeavour to preſerve their State of Reſt or uniform Motion in a right Line; That the Change of Motion is always in Proportion to the Force impreſſed, and in the ſame Direction; and That Action and Re-action are always equal, and in contrary Directions.

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CENTRIPETAL and Centrifugal Forces defined and explained by Experiments.

GALILEO's famous experimental Demonſtration, that Bodies, falling freely by the Force of Gravity, are accelerated in ſuch a Manner as to deſcribe Spaces in a duplicate Ratio of the Times in which they fall.

LECTURE III.

THE Effects of oblique and compound Forces ſhewn and accounted for; with the Method and Examples of Compoſition and Reſolution of Forces.

VELOCITY diſtinguiſhed from Motion, and the Momentum or Quantity of Motion in Bodies defined, with its Application to the Mechanical Powers.

THE Doctrine of Motion applied to determine and compute the Powers of the Lever, Balance, and Pulley, and illuſtrated by a Number of Experiments.

LECTURE IV.

OF the Wheel and Axle, Wedge, Screw, and Inclined Plane; with the Calculation of their Forces, as alſo of all poſſible Combinations of Mechanical Engines; with a Multitude of Experiments to confirm and illuſtrate the Theory.

THE Laws of Motion and the Mechanical Powers further applied to real Practice in Life, and the Advantage and Defects of moſt of the Inſtruments, Machines and Engines now in Uſe, ſhewn and evinced: Together with ſome Conſiderations on Friction, and the Reſiſtance of Mediums, and how to determine what Degree of Impediment Mechanical Engines are clogged with from ſuch Obſtructions to their Motion; and by what Means and Contrivances it may be beſt remedied or avoided.

THE Theory of Projectiles and Vibration of Pendulums deduced from the Principles and Laws of Motion, and made plain by a great Variety of Experiments.

LECTURE V.

FLUIDS defined, and the Nature of Fluidity explained.

THAT Fluids gravitate *in proprio loco*, or that every Part of a Fluid gravitates, and preſſes on the Parts which it reſts upon, and that the Preſſure is not only propagated downwards, but upwards, and ſideways, in all poſſible Directions.

THE Air ſhewn to be a Fluid, and endowed with all the Properties of other Fluids; particularly that it is heavy, by weighing a Quantity of Air in a Balance.

THAT different Kinds of Fluids gravitate and preſs upon each other in the ſame Manner, though not in the ſame Degree, that the Parts of the ſame Fluid preſs one on another.

THE Preſſure of Fluids ſhewn to be in Proportion to their perpendicular Altitudes, without any Regard to their Quantity; and hence any Quantity of Water, though ever ſo ſmall, may be made to preſs with a Force equal to that of any given Weight, how great ſoever.

THE Expence (or Quantity) of Water, ſpouting from equal Holes at different Diſtances from the Surface, demonſtrated to be as the ſquare Roots of theſe Diſtances.

THAT the heavieſt Bodies may be ſupported and buoyed up by the lighteſt Fluids, and the lighteſt de-

depreſſed and kept down at the Bottom by the Heavieſt.

LECTURE VI.

THE Structure of the Air-pump, and the Uſe of the ſeveral Parts explained, with the Manner of its working.

THE Nature and Properties of the Air further conſidered, particularly its Compreſſibility and Elaſticity.

THE Demonſtration of theſe peculiar and ſurpriſing Properties by many curious and entertaining Experiments on the Air-pump; and alſo, that the Elaſticity or Spring of the Air is always equal to the Force wherewith it is compreſſed.

OF the Atmoſphere, its State and Limits, and what is meant by a Pillar or Column of it.

THAT the Gravity of the Air is increaſed as the Height of a Column of the Atmoſphere is increaſed; and that the Spring of the Air is every where equal to its Gravity.

AN eaſy Method of calculating at any Time the Weight or exact Preſſure of the Atmoſphere, upon

upon the Surface of Bodies expoſed to it, and eſpecially the prodigious Weight ſuſtained by the human Body, confirmed by actual Experiments, and the Reaſons aſſign'd why we are not ſenſible of it.

The Effects of rarified Air on Fire, and the Life of Animals; Nature of Reſpiration, demonſtrated to the Senſe, by artificial Lungs.

LECTURE VII.

CONTINUATION of the numerous and entertaining Experiments on the Air-pump, for the further confirming and illuſtrating the Properties of the Air.

The Operation of Cupping, both by the Lamp and Syringe explained.

LECTURE VIII.

AN Enquiry into the Origin, Structure, and Uſes of Barometers, Thermometers, Hygrometers, and other Inſtruments, ſerving to point out what Changes happen in the Air, and what Weather may be expected from theſe Alterations.

The Suſpenſion of the Mercury in the Barometer

meter proved undeniably to be the Effect of the Preſſure of the Atmoſphere only; from whence is deduced an eaſy Method for meaſuring the Height of Mountains, and Depth of Mines by the Barometer.

The Effects and great Uſe of the Air's Preſſure in working Machines, for raiſing Water, illuſtrated by curious Glaſs Models of various Kinds of Pumps, in which the Action of the Piſtons and Valves is expoſed to the Eye.

The Working of Fountains, Jets, and Siphons, explained from the ſame Principle.

The Method of Diving to great Depths at Sea ſhewn by a Model of the Diving-Bell, as improved by Dr *Halley*.

LECTURE IX.

THE Conſtruction of the condenſing Engine explained, with a Number of Experiments to ſhew the Effects of condenſed or compreſſed Air.

Fountains, with Variety of Jets played by the Elaſticity of compreſſed Air.

The Nature of Sound explained; with Experiments to ſhew that Air is abſolutely neceſſary to its Propagation.

Of Fire; and the Effect it has upon Bodies, ſolid and fluid, accounted for.

Its Action on the Air exemplified by a working Model of the Smoke-Jack.

The Fabrick of the Fire Engine explained, and its Manner of Working; together with the Method of calculating its Power, to any Size, and the Quantity of Water that it will raiſe from any Depth in a given Time.

LECTURE X.

THE ſpecific Gravity of Bodies explained, and the natural Reaſon thereof aſſigned.

The Hydroſtatical Balance, and its Apparatus ſhewn and explained.

The Uſe and Application of the Hydroſtatical Balance in the actual Determination of the ſpecific Gravity of Bodies, both ſolid and fluid.

The Reaſon of Bodies ſinking or ſwimming in Fluids, with an Explanation of abſolute and relative Gravity or Weight.

LECTURE XI.

THE Nature of Electricity explained upon the moſt approved and beſt eſtabliſhed Principles, which will be illuſtrated and confirmed by a Series of many ſurpriſing Experiments.

A rational Account of the Cauſes of Winds, Rain, Hail, Snow, Dews, Vapours, Meteors, and the Origin of Springs.

LECTURE XII.

FIRE and Light defined according to Sir *Iſaac Newton*, being only different Appearances of the ſame Thing.

Light not propagated inſtantaneouſly, but ſucceſſively and in Time.

The Refraction and Reflexion of Light explained and accounted for.

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THE Method of meaſuring and comparing the Angles of Incidence, with thoſe of Refraction and Reflexion.

THE Conſtruction and Uſe of Optical Inſtruments explained; and the Reaſons aſſigned of all Appearances exhibited by Lenſes, Teleſcopes, Microſcopes, Multiplying-Glaſſes, and Mirrors of all Kinds.

LECTURE XIII.

THE Structure and Anatomy of the Eye ſhewn by Diſſection, and the Nature of Viſion illuſtrated and explained.

THE Camera Obſcura and its Uſe, by Means of which, and of an artificial Eye, will be demonſtrated, that the Images of external Objects are impreſſed on the Retina in an inverted Poſition.

SEVERAL ſurpriſing Optical Appearances exhibited and accounted for, amongſt which are thoſe of the Magic Lantern.

SIR *Iſaac Newton*'s Theory of Light and Colours explained, and confirmed by a Number of his principal Experiments.

LECTURE XIV.

THE Figure of the Earth determined, and its Motion fully proved.

LATITUDE and Longitude explained, both with regard to Places on the Earth, and the Celeſtial Bodies.

THE true Solar Syſtem and that of the Univerſe demonſtrated, in Oppoſition to the vulgar Notions, and the falſe Hypotheſes of ancient Philoſophers.

THE Laws of the Motion of the Planets, upon the Principles of the *Newtonian* Philoſophy, with the Magnitudes, Diſtances, and periodical Times of the Revolutions of the Heavenly Bodies.

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LECTURE XV.

THE Nature of the fixed Stars, their Order amongſt themſelves, and their Diſtribution into Conſtellations; together with the Method of diſtinguiſhing them.

THE apparent Motion of the Sun, Moon, and other Planets among the Fixed Stars; with the

Natural Cauſes of Day and Night, of the Variety of Seaſons, and of Solar and Lunar Eclipſes.

The Path of the Moon deſcribed in particular, and the Reaſons of her different Phaſes or Appearances.

An Explanation of that remarkable Phænomenon of the Harveſt Moon.

The Effects of the mutual Attraction of the Planets, ariſing from the univerſal Principle of Gravitation, particularly applied to account for the Tides.

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